US007909033B2

(12) **United States Patent**
Faram

(10) **Patent No.: US 7,909,033 B2**
(45) **Date of Patent: Mar. 22, 2011**

(54) **BREATHING TREATMENT APPARATUS**

(75) Inventor: **Joseph Dee Faram**, Dallas, TX (US)

(73) Assignee: **Comedica Incorporated**, Dallas, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 973 days.

(21) Appl. No.: **11/743,770**

(22) Filed: **May 3, 2007**

(65) **Prior Publication Data**

US 2007/0256690 A1 Nov. 8, 2007

Related U.S. Application Data

(60) Provisional application No. 60/746,355, filed on May 3, 2006.

(51) **Int. Cl.**
F16K 31/02 (2006.01)
B67D 7/00 (2010.01)

(52) **U.S. Cl.** **128/204.21**; 128/204.18; 128/204.25; 222/3; 222/299

(58) **Field of Classification Search** 128/203.12, 128/203.16, 204.14, 204.18, 204.21, 204.25; 222/3, 299
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

402,779	A		5/1889	Steinhoff
1,150,238	A		8/1915	Winbray
3,083,707	A		4/1963	Seeler
3,291,122	A		12/1966	Engstrom et al.
3,301,255	A		1/1967	Thompson
3,537,448	A		11/1970	Liston
3,561,444	A		2/1971	Boucher
3,584,621	A	*	6/1971	Bird et al. 128/200.18
3,861,386	A		1/1975	Harris et al.
4,054,134	A		10/1977	Kritzer
4,062,358	A		12/1977	Kritzer
4,182,599	A		1/1980	Eyrick et al.
4,245,633	A		1/1981	Erceg
4,436,090	A		3/1984	Darling
4,558,710	A		12/1985	Eichler
4,601,465	A		7/1986	Roy
4,635,857	A		1/1987	Hughes
4,770,164	A		9/1988	Lach et al.
4,951,659	A		8/1990	Weiler et al.
4,964,404	A		10/1990	Stone
4,973,047	A		11/1990	Norell
4,981,295	A		1/1991	Belman et al.
5,018,517	A		5/1991	Liardet
5,027,809	A		7/1991	Robinson
5,067,707	A		11/1991	Køhnke
5,069,449	A		12/1991	Wardwell
5,107,830	A		4/1992	Younes
5,127,400	A		7/1992	DeVries et al.
5,150,291	A		9/1992	Cummings et al.
5,193,529	A		3/1993	Labaere
5,261,394	A		11/1993	Mulligan et al.
5,277,175	A		1/1994	Riggs et al.

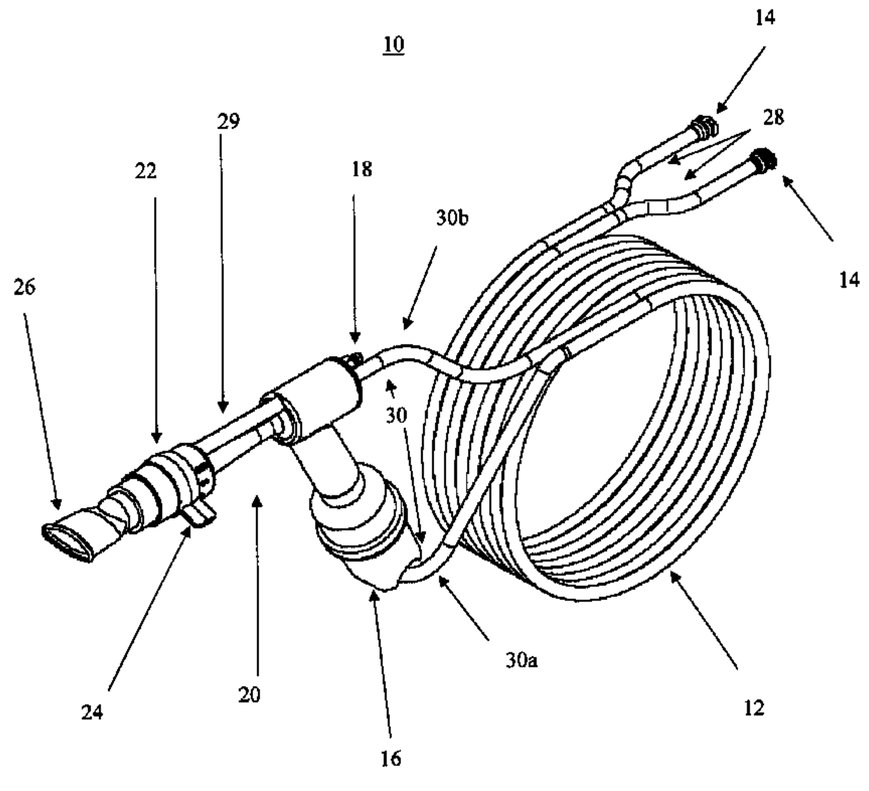
(Continued)

Primary Examiner — Justine R Yu
Assistant Examiner — Valerie Skorupa
(74) *Attorney, Agent, or Firm* — Barnes & Thornburg LLP

(57) **ABSTRACT**

The present invention relates to a method and apparatus for treating a variety of breathing disorders experienced by patients. The invention is particularly suited to the treatment of atelectasis, the partial or total collapse of the lung, although those skilled in the art will appreciate that it has applications in treating other disorders as well. Treating patients with breathing disorders traditionally has required the use of multiple types of apparatus in order to provide the multiple types of treatment used. The present invention provides for a treatment apparatus that is enabled to provide multiple types of treatment, depending on the needs of the patient.

24 Claims, 3 Drawing Sheets



U.S. PATENT DOCUMENTS

5,322,057	A		6/1994	Raabe et al.	
5,355,873	A		10/1994	Del Bon et al.	
5,390,665	A		2/1995	Leach	
5,398,676	A		3/1995	Press et al.	
5,413,110	A		5/1995	Cummings et al.	
5,423,313	A		6/1995	Olsson et al.	
5,439,430	A		8/1995	Rubens et al.	
5,451,190	A		9/1995	Liardet	
5,535,738	A		7/1996	Estes et al.	
5,542,416	A		8/1996	Chalvignac	
5,547,440	A		8/1996	Rubens et al.	
5,570,682	A	*	11/1996	Johnson	128/200.14
5,598,839	A		2/1997	Niles et al.	
5,617,847	A		4/1997	Howe	
5,664,562	A		9/1997	Bourdon	
5,666,945	A		9/1997	Davenport	
5,713,349	A		2/1998	Keaney	
5,823,179	A		10/1998	Grychowski et al.	
5,829,429	A		11/1998	Hughes	
5,906,198	A		5/1999	Flickinger	
5,937,857	A		8/1999	Caterini et al.	
5,938,117	A		8/1999	Ivri	
5,950,619	A		9/1999	Van Der Linden et al.	
5,964,223	A		10/1999	Baran	
5,970,974	A		10/1999	Van Der Linden et al.	
6,044,841	A		4/2000	Verdun et al.	
6,058,932	A		5/2000	Hughes	
6,076,519	A		6/2000	Johnson	
6,076,520	A		6/2000	Cooper	
6,079,413	A		6/2000	Baran	
6,085,740	A		7/2000	Ivri et al.	
6,085,746	A		7/2000	Fox	
6,116,233	A		9/2000	Denyer et al.	
6,152,134	A	*	11/2000	Webber et al.	128/205.24
6,167,881	B1		1/2001	Hughes	
6,210,345	B1		4/2001	Van Brunt	
6,234,167	B1		5/2001	Cox et al.	
6,240,919	B1		6/2001	MacDonald et al.	
6,289,892	B1		9/2001	Faithfull et al.	
6,302,105	B1		10/2001	Wickham et al.	
6,336,455	B1		1/2002	Howlett	
6,340,025	B1		1/2002	Van Brunt	
6,355,002	B1		3/2002	Faram et al.	
6,363,932	B1		4/2002	Forchione et al.	
6,402,046	B1		6/2002	Loser	
6,405,934	B1		6/2002	Hess et al.	
6,412,481	B1		7/2002	Bienvenu et al.	
6,415,791	B1		7/2002	Van Brunt	
6,425,393	B1		7/2002	Lurie et al.	
6,427,690	B1		8/2002	McCombs et al.	
6,450,163	B1		9/2002	Blacker et al.	
6,467,476	B1		10/2002	Ivri et al.	
6,526,976	B1		3/2003	Baran	
6,540,153	B1		4/2003	Ivri	
6,540,154	B1		4/2003	Ivri et al.	
6,546,927	B2		4/2003	Litherland et al.	
6,550,472	B2		4/2003	Litherland et al.	
6,550,476	B1		4/2003	Ryder	
6,557,549	B2		5/2003	Schmidt et al.	
6,568,387	B2		5/2003	Davenport et al.	
6,571,790	B1		6/2003	Weinstein	
6,581,596	B1		6/2003	Truitt et al.	
6,581,598	B1		6/2003	Foran et al.	
6,581,600	B2	*	6/2003	Bird	128/205.24
6,588,421	B1		7/2003	Diehl et al.	
6,588,422	B1		7/2003	Berthon-Jones et al.	
6,595,203	B1		7/2003	Bird	
6,598,602	B1		7/2003	Sjoholm	
6,598,603	B1		7/2003	Andersson et al.	
6,609,517	B1		8/2003	Estes et al.	
6,612,303	B1		9/2003	Grychowski et al.	
6,615,831	B1		9/2003	Tuitt et al.	
6,626,175	B2		9/2003	Jafari et al.	
6,631,721	B1		10/2003	Salter et al.	
6,640,806	B2		11/2003	Yurko	
6,644,304	B2		11/2003	Grychowski et al.	
6,644,310	B1		11/2003	Delache et al.	
6,644,311	B1		11/2003	Truitt et al.	
6,663,574	B2		12/2003	Faram et al.	
6,679,258	B1		1/2004	Strom	
6,694,969	B1		2/2004	Heinonen et al.	
6,702,998	B2		3/2004	Conner	
6,708,688	B1		3/2004	Rubin et al.	
6,718,969	B1		4/2004	Rubin et al.	
6,722,362	B2		4/2004	Hete et al.	
6,729,334	B1		5/2004	Baran	
6,737,042	B2		5/2004	Rabinowitz et al.	
6,752,151	B2		6/2004	Hill	
6,776,159	B2		8/2004	Pelerossi et al.	
6,805,120	B1		10/2004	Jeffrey et al.	
6,823,866	B2		11/2004	Jafari et al.	
6,848,443	B2		2/2005	Schmidt et al.	
6,851,425	B2		2/2005	Jaffre et al.	
6,854,462	B2		2/2005	Berthon-Jones et al.	
6,904,906	B2		6/2005	Salter et al.	
6,907,881	B2		6/2005	Suki et al.	
6,910,479	B1		6/2005	Van Brunt	
6,915,803	B2		7/2005	Berthon-Jones et al.	
6,932,084	B2		8/2005	Estes et al.	
6,948,497	B2		9/2005	Zdrojkowski et al.	
6,968,840	B2		11/2005	Smith et al.	
7,011,091	B2		3/2006	Hill et al.	
7,036,500	B2		5/2006	Niles et al.	
7,059,324	B2		6/2006	Pelerossi et al.	
7,066,176	B2		6/2006	Jaffe et al.	
7,070,761	B2		7/2006	Rabinowitz et al.	
7,100,607	B2		9/2006	Zdrojkowski et al.	
7,128,069	B2		10/2006	Farrugia et al.	
7,165,547	B2		1/2007	Truitt et al.	
7,188,621	B2		3/2007	DeVries et al.	
7,191,776	B2		3/2007	Niles et al.	
7,191,780	B2		3/2007	Faram	
7,204,245	B2		4/2007	Johnson et al.	
7,210,480	B2		5/2007	Lurie et al.	
7,232,417	B2		6/2007	Plante	
7,302,949	B2		12/2007	Pelerossi et al.	
7,445,607	B2		11/2008	Plante	
7,469,700	B2		12/2008	Baran	
7,472,702	B2		1/2009	Beck et al.	
7,472,705	B2		1/2009	Baran	
7,500,481	B2		3/2009	Delache et al.	
7,562,657	B2		7/2009	Blanch et al.	
7,600,511	B2		10/2009	Power et al.	
7,699,054	B2		4/2010	Pelerossi et al.	
2001/0004893	A1	*	6/2001	Biondi et al.	128/204.18
2002/0020412	A1	*	2/2002	Gilbert et al.	128/203.12
2003/0051731	A1		3/2003	Be'eri et al.	
2003/0140925	A1		7/2003	Sapienza et al.	
2003/0205229	A1		11/2003	Crockford et al.	
2005/0061318	A1	*	3/2005	Faram	128/204.18
2005/0109340	A1		5/2005	Tehrani	
2005/0165334	A1		7/2005	Lurie	
2005/0217666	A1	*	10/2005	Fink et al.	128/200.14
2006/0084877	A1	*	4/2006	Ujhazy et al.	600/483
2006/0144398	A1		7/2006	Doshi et al.	
2006/0178245	A1		8/2006	Schiller et al.	
2006/0201500	A1		9/2006	Von Hollen et al.	
2006/0243274	A1		11/2006	Lieberman et al.	
2006/0272642	A1		12/2006	Chalvignac	
2007/0017522	A1		1/2007	Be-Eri et al.	
2007/0017523	A1		1/2007	Be-Eri et al.	
2007/0089740	A1		4/2007	Baumert et al.	
2007/0186928	A1		8/2007	Be-Eri	
2008/0000475	A1		1/2008	Hill	
2008/0000477	A1		1/2008	Huster et al.	
2008/0015456	A1		1/2008	McCawley et al.	
2008/0091117	A1		4/2008	Choncholas et al.	
2008/0190429	A1		8/2008	Tatarek	
2008/0283060	A1		11/2008	Bassin	
2009/0020121	A1		1/2009	Bassin	

* cited by examiner

FIG. 1

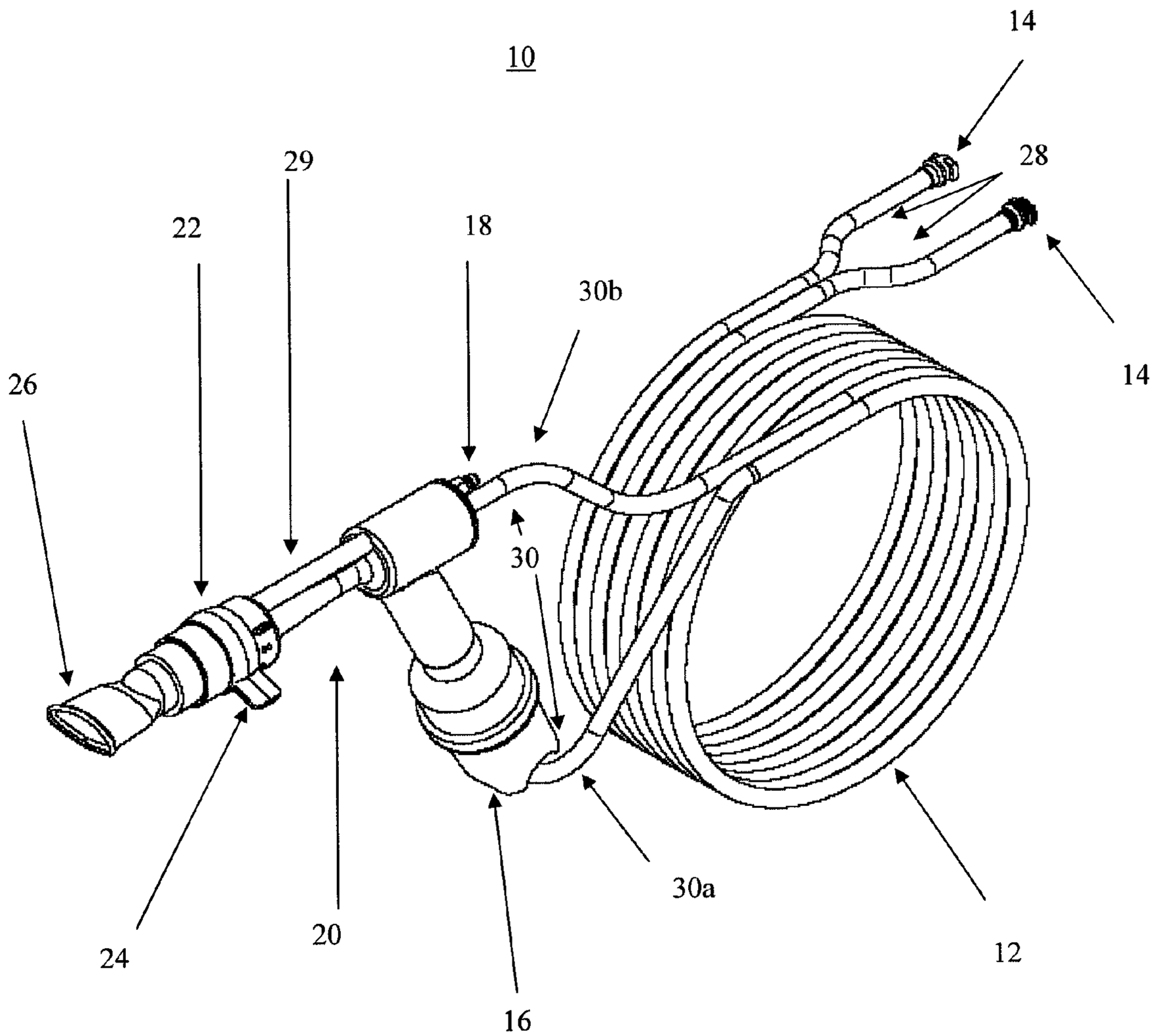


FIG. 2

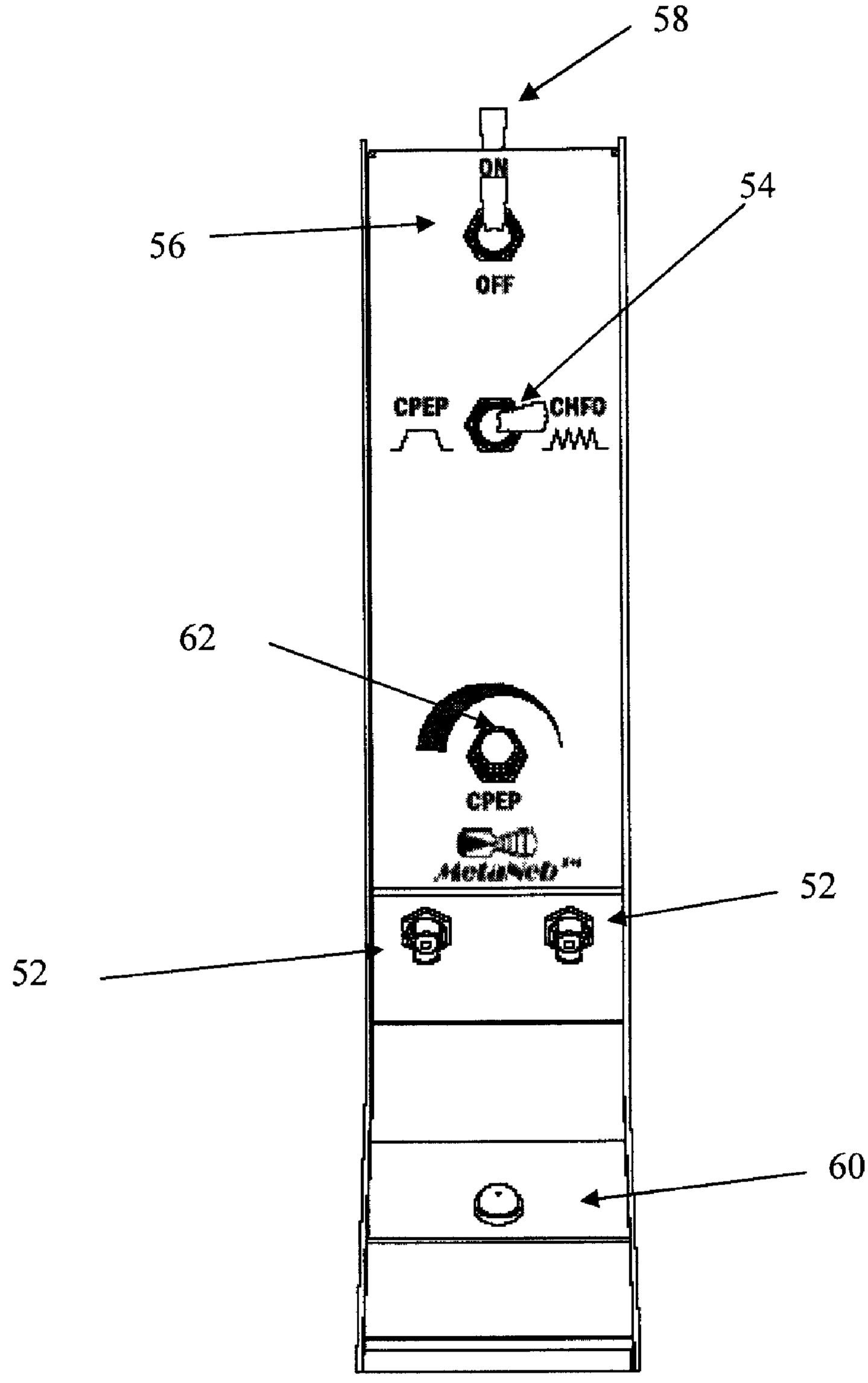
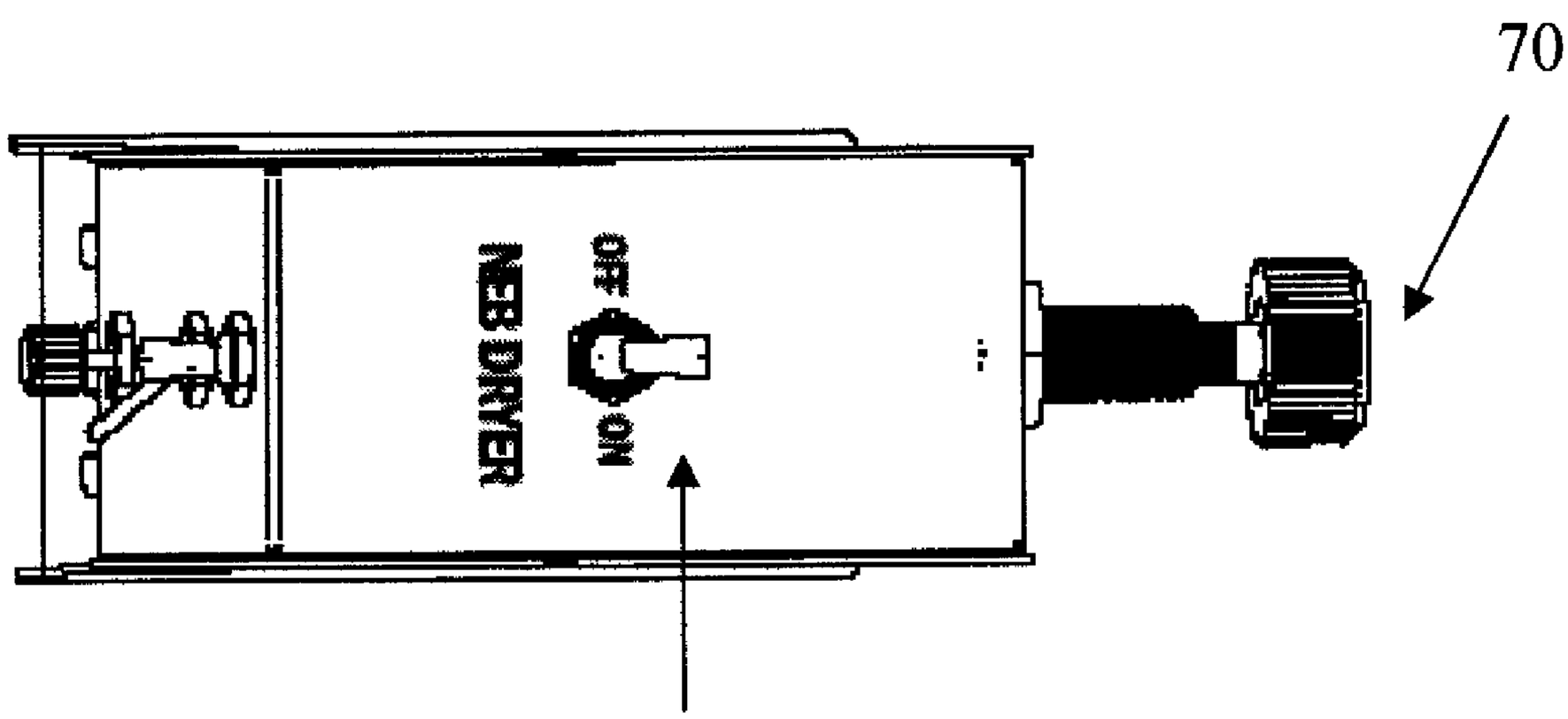


FIG. 3



BREATHING TREATMENT APPARATUS

CROSS-REFERENCE TO RELATED APPLICATION

This application claims the benefit of priority from U.S. Provisional Application No. 60/746,355 filed on May 3, 2006.

FIELD OF THE INVENTION

The invention relates to a therapeutic breathing device that delivers multiple therapies in order to facilitate the prevention and treatment of certain pulmonary diseases.

BACKGROUND OF THE INVENTION

Atelectasis is the partial or total collapse of the lung. Although this condition may occur as a result of pressure being exerted from outside the lungs by such maladies as a tumor or fluid buildup in the pleural space, it is most often caused by obstruction within the airways. When blockage develops the air in the small air sacs, or alveoli, on the distal side of the obstruction is absorbed into the bloodstream and the air sacs become diminished in size or collapse. These alveoli then often fill with blood cells, mucus, or serum, making them highly susceptible to infection. Atelectasis may happen suddenly or gradually manifest over a long period of time. In either case the disorder may lead to shortness of breath, decreased oxygen levels, increased heart rate, and infection, which in turn can result in outcomes ranging from simple discomfort to death.

Traditionally, prevention and treatment of atelectasis have included a wide variety of devices that facilitate treatment in three main areas: 1) medicated aerosol delivery, 2) lung expansion therapy, and 3) secretion clearance therapy. The variety of devices used in these therapies presents a number of problems. First, for any given patient it is difficult to know in advance which therapy or combination of therapies is most appropriate. After assessing the patient at bedside, the clinician may decide that the patient requires a different therapy than planned, at which point he or she must return to a supply room to secure the proper therapy device or devices. This can be time consuming and can delay treatment at a time when prompt application of treatment is crucial. Second, in order to be prepared to deliver appropriate therapy, the healthcare provider must stock a number of devices, which presents the provider with the requirements of storage space and the need to deal with a number of suppliers. Furthermore, maintaining a number of different devices, and their attendant disposable accessories, to provide multiple therapy options increases costs to the healthcare provider and ultimately the patient. Third, in order to adequately utilize various devices a clinician must attend multiple training sessions, further increasing costs to the healthcare provider and patient.

Thus, there has been a need for a single apparatus which is capable of delivering a number of different breathing therapies, thereby eliminating the need for multiple devices, but which is also cost effective and does not significantly increase the time required to train operators in its use.

SUMMARY OF THE INVENTION

The present invention combines aerosol delivery, lung expansion therapy, and secretion clearance therapy into a single apparatus. In one aspect of the present invention, aerosol delivery can be combined with either pulsatile gas flow to provide a secretion clearance mode, or with a linear gas flow to provide a lung expansion mode. A third mode of operation is also disclosed in which linear gas flow without aerosol delivery is provided to the patient. The apparatus is comprised of a gas control box and a patient interface circuit. The gas control box controls the flow of gas from the gas source to the patient interface circuit. The patient interface circuit may be of single patient use and utilizes a fixed venturi and orifices open to the atmosphere for entrainment. The circuit also includes an exhalation opening which can be adjusted to maintain a positive pressure in the lungs at the end of exhalation (Positive End Expiratory Pressure or PEEP) without the stacking of successive volumes of gas in the airways (breath stacking). PEEP helps to open the airways and keep them open during the therapy. The apparatus is designed to minimize both clinical training requirements and operator errors during treatment. Additionally, with several therapies combined into one machine, the clinician can change therapies as needed without having to return to an equipment storage area to retrieve other devices. Storage requirements are reduced and the healthcare provider can deal with a single source vender for supplies, training, and repairs. It is expected that the healthcare provider would also achieve significant cost savings through the reduction in the number of different types of equipment required to perform the various treatments performed by the current apparatus.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood with reference to the drawings taken in connection with the detailed description which follows:

FIG. **1** is a view of the Patient Interface Circuit of the present invention;

FIG. **2** is an elevation view of the front face of the Gas Control Box of the present invention; and

FIG. **3** is a top-down view of the Gas Control Box of the present invention.

DETAILED DESCRIPTION

The present invention relates to a method and apparatus for treating a variety of breathing disorders experienced by patients. The invention is particularly suited to the treatment of atelectasis, the partial or total collapse of the lung, although those skilled in the art will appreciate that it has applications in treating other disorders as well. In a patient suffering from atelectasis, the lung can become partially or completely deflated due to fluid buildup, or from physical pressure such as from a trauma or tumor. If this occurs, the lung may not be able to re-inflate on its own, which can in turn exacerbate the patient's condition leading to a progressively worsening physical state or even death.

Treating a patient with atelectasis traditionally has required the use of multiple types of apparatus in order to provide the multiple types of treatment used. The present invention provides for a treatment apparatus that is enabled to provide multiple types of treatment, depending on the needs of the patient.

Referring to FIGS. **1**, **2**, and **3**, the invention is comprised generally of a patient interface circuit **10**, and a gas control box **50**. Patient interface circuit **10** is fluidly connected to gas control box **50** and provides transportation of breathing treatment gas (not shown) from gas control box **50** to the patient (not shown). In a first embodiment, patient interface circuit **10** is comprised of a length of tubing **12** having first and second ends **28** and **30**, a nebulizer **16**, a manometer port **18**, and

handset **20**, a selector ring **22** with a selector ring tab **24** and a mouthpiece **26**. Tubing **12** is of medical grade quality of a type commonly available from medical supply houses. One or more connectors **14** may be used to enable first end **28** of tubing **12** to be removably connected to one or more circuit connectors **52** located on gas control box **50**. However, the connectors **14** are not required in the event that tubing **12** is to be permanently connected to gas control box **50**, or if gas control box **50** is fitted with a type of connector which is capable of interfacing with the ends of tubing **12** in such a way as to create a substantially gas tight connection between first end **28** of tubing **12** and gas control box **50**. In a preferred embodiment, tubing **12** is double stranded, in that it is made up of two separate gas conduits that are longitudinally attached to each other, but which are not in fluid communication. Such tubing is commonly known as paratubing. If connectors **14** are used, one connector is required for each gas conduit, thus in the preferred embodiment, the connectors **14** and circuit connectors **52** may be color coded to assist the operator in making the correct connections between connectors **14** and circuit connectors **52** at gas control box **50**.

Second end **30** of tubing **12** is fluidly connected to nebulizer **16** and provides gas flow which is used to entrain medicine or other substances contained within the nebulizer. Nebulizer technology is well known in the art and does not need to be recounted here. Examples of nebulizer technology may be seen at U.S. Pat. No. 6,929,003, Nebulizer Apparatus and Method, and U.S. Pat. No. 6,748,945, Nebulizer Apparatus and Method.

In an embodiment wherein tubing **12** is paratubing, the ends **30***a* and **30***b* of second end **30** may be separated and attached to nebulizer **16** at one or more entry points, or may bypass nebulizer **16** altogether. For example, first end **30***a* may enter nebulizer **16** at a point wherein the gas flowing from tubing **12** is used to aerosolize liquid medication held within nebulizer **16**, while a second end may enter handset **20** at a point where it is directed through handset **20** so that it may entrain aerosolized medication so that it may be delivered to the patient. While the disclosed embodiment describes the invention as including nebulizer **16**, it should be apparent to one skilled in the art that nebulizer **16** is not required for all applications and that the invention disclosed includes embodiments wherein nebulizer **16** is excluded.

In the preferred embodiment, gas exits nebulizer **16** and flows into handset **20**, although, if nebulizer **16** is excluded, gas will flow directly from tubing **12** into handset **20**. Once in handset **20**, gas is entrained into an integral venturi, and then continues out mouthpiece **26** where it is inhaled by the patient. As the patient exhales back into mouthpiece **42** some of the exhalation gas exits an exhalation port (not shown). The exhalation port may be made larger or smaller by adjusting selection collar **22** using exhalation collar tab **24**. In a preferred embodiment, proximal pressure is transmitted from patient back through pressure sensing tube **29**, which is connected to manometer port **18**. Pressure can be monitored by connecting a manometer (not shown) to manometer port **18**.

Turning to FIGS. **2** and **3**, FIG. **2** shows a front view perspective of gas control box **50**, which may be enabled to regulate the flow of gas to the patient. Specifically, gas control box **50** may comprise one or more control devices of the type commonly known in the art such as valves, control interfaces, flow regulators, and the like. Patient interface circuit **20** is connected to gas control box **50** at one or more connectors **52**. In a preferred embodiment, to begin a breathing therapy session, the clinician selects one of one or more breathing treatment modes depending on the condition of the patient. In the preferred embodiment shown, the clinician may select from between lung expansion CPEP™ mode (Continuous Positive Expiratory Pressure) or secretion mobilization CHFO™ mode (Continuous High-frequency Oscillation) although those skilled in the art will recognize that alternative therapies could be selected without deviating from the scope and content of the present invention. Mode selection is accomplished by moving mode selector switch **54** to the desired setting. The therapy is initiated by moving master switch **56** from the "off" position to the "on" position. After the therapy has been turned on the patient may begin the therapy by placing his or her mouth onto mouthpiece **26** and breathing normally.

If CPEP™ mode has been chosen, the gas flow is linear. The rate of flow can be adjusted by moving CPEP™ control knob **62**. In the embodiment shown, counterclockwise rotation of control knob **62** results in increased flow, while clockwise rotation would decrease the gas flow. Other types of control mechanisms such as sliders, switches and digital interfaces could be substituted without deviating from the scope of the invention. Furthermore, the direction of movement of the control mechanism is not critical, and other variations would be within the scope of the invention.

IF CHFO™ mode has been chosen, gas flow is pulsatile in nature at substantially constant amplitude. In a preferred embodiment, gas flow is regulated or adjusted so that it is pulsitile at a rate of from 1 to 15 hertz at substantially constant amplitude.

Following the desired amount of time in therapy, master switch **56** is returned to the "off" position and patient interface circuit **20** may be disconnected.

In an alternative embodiment, gas control box **50** may be equipped with a nebulizer dryer spray nozzle. If a nebulizer **16** has been used in therapy, it may be desirable to reuse nebulizer **16** rather than simply discarding it. If nebulizer **16** is to be reused, however, it should be cleaned and dried prior to reuse. The clinician, or other operator, would thus wash nebulizer **16** in any of a number of known ways, including using soap and water. Following cleaning and/or rinsing, nebulizer **16** may be dried by moving nebulizer dryer switch **58** to the "on" position. This sends a flow of gas through dryer spray nozzle **60**. Nebulizer **16** is held in front of spray nozzle **60** until it is dry. Neb dryer switch **58** is returned to the "off" position.

FIG. **3** shows a top view perspective of gas control box **50**. Source gas connector **70** is connected to an appropriate gas source such as compressed air or oxygen.

Additional embodiments of the present invention are also possible. In another embodiment, a means for preventing inadvertent occlusion of the exhalation ports such as guards or screens positioned so as to prevent inadvertent blockage of the ports while still allowing gas flow through the ports.

In another embodiment, means for tracking patient use of the apparatus is included. Such means for tracking use would include any means whereby the identity of the individual using the apparatus may be tracked as well as the duration and type of treatment received. Such means could be as simple as printed records requiring patient acknowledgement that he or she received treatment, more complex means such as digital identification media capable of interfacing with the apparatus in such a way that the apparatus could identify the patient and then record treatment particulars itself.

In another embodiment, the described apparatus can be connected to, and be incorporated into, a ventilator circuit.

In another embodiment, the apparatus includes a means for supplying its own compressed gas rather than relying on an external gas source. Such means could include means for receiving and/or storing containers of compressed gas, or onboard compressor means for creating compressed gas.

In another embodiment, the disclosed apparatus includes means for measuring and/or displaying data concerning the treatment provided. Such means could include digital or analog gauges or displays and could be used to display pressure or flow rate at any point along patient interface circuit **10** or within gas control box **50**. Means for measuring and displaying gas flow rate and pressure are well known in the art and will not be recounted herein.

In another embodiment, the apparatus includes means for displaying waveforms, such as a monitor.

In another embodiment, the apparatus includes means for transmitting and receiving data, either wirelessly or wired.

In another embodiment, the patient interface circuit is disposable.

In another embodiment, the apparatus includes means for collecting and analyzing data. As will be appreciated by those having skill in the art, many methods and devices may be used to collect and analyze data, such as sensors and computer systems.

What is claimed:

1. A breathing treatment apparatus comprising:

a source of gas under pressure capable of providing substantially continuous positive gas flow;

regulator means for regulating the flow of said substantially continuous positive gas flow between said source and a patient;

selector means for selecting between one or more modes of operation, including at least a first mode of operation and a second mode of operation;

means for interrupting said continuous positive gas flow;

a patient interface circuit having one or more apertures open to the ambient to allow ingress and egress of flow and calibrated to allow patient exhalation and prevent stacking of successive volumes of gas in the airway of the patient, the patient interface circuit further having a removable nebulizer, a venturi tube fluidly connected to said one or more apertures, and a means for covering a portion of said one or more apertures to restrict ingress and egress of flow; and

a gas control box housing the regulator means and the means for interrupting, the housing carrying the selector means, the housing having a first connector to which the source of gas couples, the housing having at least one second connector to which the patient interface circuit couples, and the housing having a nebulizer dryer nozzle through which gas is expelled to dry the nebulizer when the nebulizer is removed from the patient interface circuit.

2. The apparatus of claim **1**, further comprising an aerosol entrainment port fluidly connectable to said nebulizer for entrainment of aerosol.

3. The apparatus of claim **1**, wherein said means for interrupting said continuous positive gas flow is capable of interrupting said continuous positive gas flow at a rate of at least 1 hertz and at most 15 hertz whereby the gas flow becomes pulsatile with a substantially constant pressure amplitude.

4. The apparatus of claim **1**, wherein in at least one of said one or more modes of operation, the patient is provided with interrupted gas flow.

5. The apparatus of claim **4**, further comprising a nebulizer and an aerosol entrainment port fluidly connectable to said nebulizer for entrainment of aerosol.

6. The apparatus of claim **5**, wherein the patient is provided with interrupted gas flow and entrained aerosol.

7. The apparatus of claim **1**, wherein in at least one of said one or more modes of operation, the patient is provided with linear gas flow.

8. The apparatus of claim **7**, further comprising an aerosol entrainment port fluidly connectable to said nebulizer for entrainment of aerosol.

9. The apparatus of claim **8** wherein the patient is provided with linear gas flow and entrained aerosol.

10. The apparatus of claim **1**, wherein the flow of said substantially continuous positive gas flow between said source and said patient is controlled by said regulator means.

11. The apparatus of claim **1**, wherein the means for interrupting said continuous positive gas flow is operator adjustable in order to achieve a desirable rate at which the flow of said continuous positive gas flow is interrupted.

12. The apparatus of claim **1**, further including a means to prevent inadvertent occlusion of said apertures.

13. The apparatus of claim **1**, further including a means for tracking use of said apparatus, whereby patient compliance with breathing therapy can be ascertained.

14. The apparatus of claim **1**, wherein said patient interface circuit is connected to and incorporated within a ventilator circuit.

15. The apparatus of claim **1**, wherein said gas under pressure comprises a container of compressed gas.

16. The apparatus of claim **1**, wherein said patient interface circuit includes a port connectable to a pressure manometer.

17. The apparatus of claim **1**, further including a means for measuring pressure.

18. The apparatus of claim **1**, further including a means for displaying pressure.

19. The apparatus of claim **1**, further including a means for displaying waveforms.

20. The apparatus of claim **1**, further including a means for collecting data.

21. The apparatus of claim **1**, further including a means analyzing data.

22. The apparatus of claim **1**, further including a communications port for at least one of transmitting and receiving data.

23. The apparatus of claim **1**, further including a nebulizer dryer switch coupled to the gas control box and movable to an "on" position to send a flow of gas through the nebulizer dryer nozzle.

24. The apparatus of claim **1**, wherein said patient interface circuit is for single patient use.

* * * * *